Current Status of Mangroves Worldwide

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Abstract

This paper describes, as a background, events that led to the publication of the 1997 *World Mangrove Atlas* and the 2010 *World Atlas of Mangroves*. The 2010 Atlas produced updated country-by-country mangrove distribution maps using remote sensing techniques and assessed the status of mangroves in each country. The current area occupied by mangroves has been estimated to be 152,360 km^2 and about 0.7% of that is lost annually. It is hoped that the 2010 Atlas will serve as a baseline for future gain/loss assessment. Largely based on the findings of the 2010 Atlas, this paper highlights the world mangrove distribution, value of mangroves, impacts and threats to mangrove ecosystems, management and conservation of mangroves, restoration and afforestation efforts, and international cooperation for preservation of mangrove ecosystems. Although the rate of mangrove deforestation has declined in recent years, much needs to be done towards balancing mangrove utilization and conservation and achieving the goals of sustainable management.

Key words: conservation, global distribution, mangrove, rehabilitation, remote sensing, sustainable management

1. Introduction

Mangroves are plant communities of the tropical and subtropical intertidal coastal zone. These trees, shrubs and herbs have developed morphological, physiological and/or reproductive strategies adapted to the harsh saline, waterlogged and anaerobic environmental conditions under which they live. Mangrove ecosystems provide a wide range of goods and services to human communities located in coastal areas.

It is generally acknowledged that the global extent of mangrove forests has been decreasing due to the rapid pace of socio-economic development in many countries. However, it is difficult to obtain accurate data to determine the area of mangrove forests at the global scale. We became aware of the necessity to produce a *World Mangrove Atlas* about 20 years ago. We prepared a project proposal, and negotiated with the International Tropical Timber Organization (ITTO) and the Japanese Government to provide us the funding as a member country of ITTO. In 1997, the *World Mangrove Atlas* was published by the International Society for Mangrove Ecosystems (ISME) and ITTO in collaboration with the World Conservation Monitoring Centre (WCMC). The 1997 Atlas received an overwhelming response and there were many requests for more recent and precise data on the extent of mangrove forests, which was still rapidly changing.

Prompted by the eager requests for more precise mangrove forest data in each country, which are difficult to obtain, we decided to compile and publish a revised atlas. We successfully secured funding from ITTO and the Japanese government in 2004. Funding from ITTO came mainly from the government of Japan together with the governments of the US and Spain. The funding imposed the condition that we had to implement the project in collaboration with relevant UN organizations as we lacked the facilities and capabilities to analyze data on mangrove areas using satellite images. After much discussion and negotiation, we finally got the project started in 2005 with a consortium of international organizations: ITTO as the funding agency; ISME as the implementing agency; and FAO, UNESCO-Man and Biosphere (MAB), UNEP-WCMC, UNU-Institute for Water Environment and Health (INWEH) and the Nature Conservancy (TNC) as partners.

Working with so many international organizations as partners was a lifetime experience for ISME. After much delay, and 'blood, sweat and tears,' we published the *World Atlas of Mangroves* in 2010. The Atlas was re-

viewed by more than 100 mangrove experts worldwide to produce a new and accurate mangrove distribution map and assess the condition of mangroves of each country. This paper, therefore, is largely based on the findings of the 2010 Atlas, which include information on the ecology, biodiversity, distribution, value, threat, conservation and management status of mangroves worldwide.

2. World Mangrove Distribution

The world mangrove distribution map is shown in Fig. 1. This map enables relatively accurate distribution and calculation of mangrove areas country-by-country, and can be used as a baseline database for future loss/gain assessments. According to the *World Atlas of Mangroves* (Spalding *et al.*, 2010), the area occupied by mangroves globally is 152,360 km^2, occurring in 123 countries and territories of the tropics and subtropics (Table 1). Over 65% of the world's mangroves are located in twelve countries with Indonesia accounting for over 20% (Table 2). Shortly after the release of the *World Atlas of Mangroves* in 2010, Giri *et al.* (2011) published an alternative estimate of the world mangrove area as 137,760 km^2, occurring in 118 countries, also derived from 2000 Landsat imageries. The difference between the two estimates is relatively small (~10%), and they complement each other, although the methods used were rather different. Both datasets have their strengths and weaknesses, and it would be a positive action to produce a combination map of the best of both.

As for regional distribution, most mangroves are found in South and Central America, West and Central Africa, and in a broad region stretching from northeast India, through Southeast Asia into Northern Australia (Spalding *et al.*, 2010). Sparse and discontinuous mangroves occur in parts of East Africa, the Middle East, South Asia and much of Australia. The global map also shows the latitudinal limits to mangrove distribution. The most northerly mangroves are in Bermuda (32°20'N) and the most southerly are at Corner Inlet, Australia (38°45'S). The largest mangrove tracts are found on wet deltaic coasts, which extend inland for several tens of kilometers, with large forest trees over 20 m in height and high in biomass. The Sundarbans of India and Bangladesh are the best known with a total area of 6,500 km^2 which extends up to 85 km inland. Large mangrove tracts are also found in northern Brazil (6,500 km^2) and the Gulf of Papua (5,400 km^2).

The 2010 Atlas also included the first-ever global compilation of mangrove species range maps for individual species, produced with expert input and support from the International Union for Conservation of Nature (IUCN). A total of 73 species and hybrids are considered to be true mangroves (Table 3). Two distinct floristic realms of mangrove distribution are recognized. The Indo-West Pacific (IWP) realm extends from East Africa eastwards to the islands of the Central Pacific, and the Atlantic East Pacific (AEP) realm includes all of the Americas, and West and Central Africa. There is no overlap in species between the two realms except for the fern *Acrostichum aureum*. The IWP and AEP realms have 62 and 12 species and hybrids, respectively. The global center of mangrove biodiversity is in Southeast Asia where the highest diversity (41-47 species) can be seen in Indonesia, Malaysia and the Philippines (Fig. 2). Diversity decreases away from the tropics, and there is not much difference in the extent of mangroves between the IWP and AEP realms, which account for 57% and 43%, respectively.

Table 1 Mangrove areas by region (Spalding *et al.*, 2010).

Region	Area (km^2)	Proportion of global total (%)
East and South Africa	7,917	5.2
Middle East	624	0.4
South Asia	10,344	6.8
Southeast Asia	51,049	33.5
East Asia	215	0.1
Australasia	10,171	6.7
Pacific Ocean	5,717	3.8
North and Central America	22,402	14.7
South America	23,882	15.7
West and Central Africa	20,040	13.1
Total	152,361	

Table 2 Top twelve countries with the largest mangrove areas in the world (Spalding *et al.*, 2010).

Country	Mangrove area (km^2)	Proportion of global total (%)
Indonesia	31,894	20.9
Brazil	13,000	8.5
Australia	9,910	6.5
Mexico	7,701	5.1
Nigeria	7,356	4.8
Malaysia	7,097	4.7
Myanmar	5,029	3.3
Bangladesh	4,951	3.2
Cuba	4,944	3.2
India	4,326	2.8
Papua New Guinea	4,265	2.8
Colombia	4,079	2.7
Total	104,552	68.5

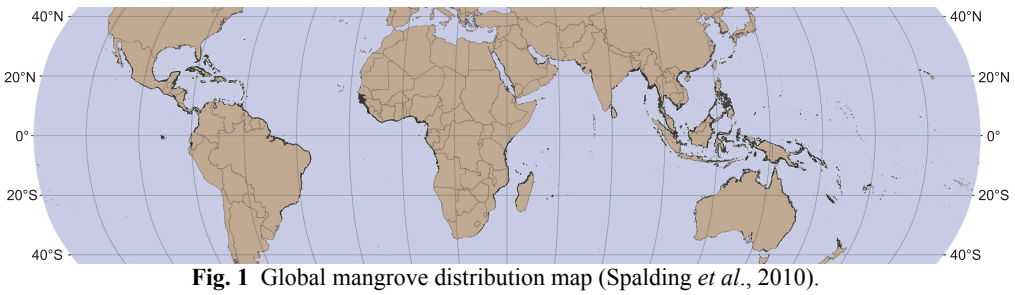

Fig. 1 Global mangrove distribution map (Spalding *et al.*, 2010).

Table 3 Mangrove species and hybrids of the Indo-West Pacific and Atlantic East Pacific realms (Spalding *et al*., 2010). Core families and species are in bold.

Family	Species	Family	Species
Indo-West Pacific			
Acanthaceae	*Acanthus ebracteatus*		***Bruguiera exaristata***
	Acanthus ilicifolius		***Bruguiera gymnorhiza***
Arecaceae	*Nypa fruticans*		***Bruguiera hainesii***
Avicenniaceae	***Avicennia alba***		***Bruguiera parviflora***
	Avicennia integra		***Bruguiera sexangula***
	Avicennia marina		*Bruguiera x rhynchopetala*
	Avicennia officinalis		***Ceriops australis***
	Avicennia rumphiana		***Ceriops decandra***
Bignoniaceae	*Dolichandrone spathacea*		***Ceriops tagal***
Bombacaceae	*Camptostemon philippinense*		***Kandelia candel***
	Camptostemon schultzii		***Kandelia obovata***
Caesalpiniaceae	*Cynometra iripa*		***Rhizophora apiculata***
Combretaceae	***Lumnitzera littorea***		***Rhizophora mucronata***
	Lumnitzera racemosa		***Rhizophora samoensis***
	Lumnitzera x rosea		***Rhizophora stylosa***
Ebenaceae	*Diospyros littorea*		*Rhizophora x lamarckii*
Euphorbiaceae	*Excoecaria agallocha*		*Rhizophora x neocaledonica*
	Excoecaria indica		*Rhizophora x selala*
Lythraceae	*Pemphis acidula*	Rubiaceae	*Scyphiphora hydrophylacea*
Meliaceae	*Aglaia cucullata*	**Sonneratiaceae**	***Sonneratia alba***
	Xylocarpus granatum		***Sonneratia apetala***
	Xylocarpus moluccensis		***Sonneratia caseolaris***
Myrsinaceae	*Aegiceras corniculatum*		***Sonneratia griffithii***
	Aegiceras floridum		***Sonneratia lanceolata***
Myrtaceae	*Osbornia octodonta*		***Sonneratia ovata***
Plumbaginaceae	*Aegialitis annulata*		*Sonneratia x gulngai*
	Aegialitis rotundifolia		*Sonneratia x hainanensis*
Pteridaceae	*Acrostichum aureum*		*Sonneratia x urama*
	Acrostichum danaeifolium	Sterculiaceae	*Heritiera fomes*
	Acrostichum speciosum		*Heritiera globosa*
Rhizophoraceae	***Bruguiera cylindrica***		*Heritiera littoralis*
Atlantic East Pacific			
Avicenniaceae	***Avicennia bicolor***	**Pellicieraceae**	***Pelliciera rhizophorae***
	Avicennia germinans	Pteridaceae	*Acrostichum aureum*
	Avicennia schaueriana	**Rhizophoraceae**	***Rhizophora mangle***
Bignoniaceae	*Tabebuia palustris*		***Rhizophora racemosa***
Caesalpiniaceae	*Mora oleifera*		*Rhizophora x harrisonii*
Combretaceae	***Conocarpus erectus***		
	Laguncularia racemosa		

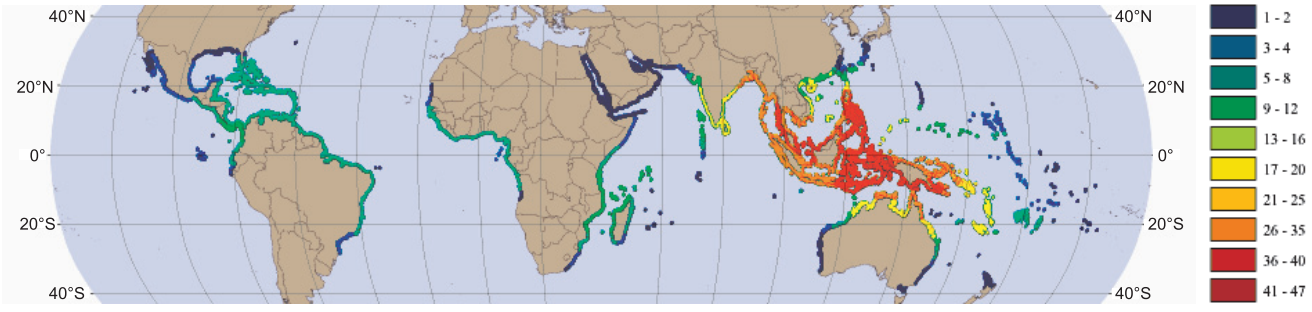

Fig. 2 Mangrove species diversity map (Spalding *et al*., 2010).
The colors indicate potential numbers of species found at the locations. It should be noted that in higher diversity areas, it is rare to find all regional species in a single site.

3. The Value of Mangroves

The value of mangroves is well documented. Goods and services include wood and non-wood forest products, medicines, fishery resources, recreation, ecotourism, biofiltration, nursery grounds, coastal protection, and carbon storage and sequestration (Field, 1995; Bandaranayake, 1998).

Of the services provided by mangrove ecosystems, there has been increasing interest in the important role of mangroves in the global carbon cycle (Bouillon *et al.*, 2008; Komiyama *et al.*, 2008; Laffoley & Grimsditch, 2009; Donato *et al.*, 2011). Mangrove forests are considered to be the most productive ecosystems with high biomass, especially below-ground. A recent study quantifying tree and dead wood biomass, soil carbon content, and soil depth in 25 mangrove forests in the Indo-Pacific region showed that mangroves are among the most carbon-rich forests in the tropics, containing an average of 1,023 MgC/ha (Donato *et al.*, 2011). The amount of carbon stored above-ground was considerable (153 MgC/ha) but the below-ground storage dominated, accounting for 71%-98% and 49%-90% of total storage in estuarine and oceanic mangroves, respectively. Carbon storage in estuarine mangroves is higher than in those in oceanic sites. Mangroves in the Indo-Pacific showed three to four times higher storage than boreal, temperate and tropical upland forests. A number of other publications have also indicated that mangroves play a significant role in storing carbon (UNFCCC, 2009; Alongi, 2011; Donato *et al.*, 2011; Siikamaki *et al.*, 2012).

4. Impacts and Threats to Mangrove Ecosystems

4.1 Extent of mangrove loss

There are no accurate data on the original coverage of mangroves, and the current areas represent a considerable decline as a result of human activities involving development and conversion in almost all countries. Even prior to these losses, mangroves were a relatively rare forest habitat. Mangroves represent less than 1% of tropical forests worldwide and less than 0.4% of the global total forest area (FAO, 2006).

A number of national and regional studies have estimated changes in mangrove area, but compiling a global estimation is a challenge because it requires consistent and accurate methods and measurements over time. While the 2010 Atlas provided the most updated global estimate of the mangrove area to date, it is not strictly comparable with earlier global estimates, as those were obtained using different mapping methods. FAO (2007) provided a detailed global assessment of the change in mangrove area over a period of 25 years (1980 to 2005), as listed in Table 4. All regions except Australia experienced dramatic losses in mangrove area over the 25-year period, including losses exceeding 20% in four regions (East Asia, Pacific Islands, Southeast Asia, and North and Central America). Although rates of loss have declined over time (from 1.04% in the 1980s to 0.66% from 2000 to 2005), they are still 3-4 times higher than the global rate of loss of all forests (0.18% per year from 2000 to 2005). Even the remaining mangrove areas are no longer pristine and highly degraded.

4.2 Causes of mangrove loss

Mangroves have been utilized by local communities all over the world. However, the loss of mangrove habitat has had severe impacts on local and often poor communities, whose livelihoods are dependent on mangrove forests and fisheries. The loss of world mangroves over the past few decades has mainly been caused by direct conversion of mangrove areas for urban and industrial development, and for aquaculture and agriculture.

Where population pressures are high and space is limited, large areas of mangroves have been converted to plantations of cash crops such as rice, coconuts and oil palms, although mangrove soils are only marginally suitable for agriculture. Another strong driver of mangrove conversion has been the growth of shrimp aquaculture, especially in Southeast Asia, and in Central and South America. It has been estimated that 38% of the global mangrove loss has been due to the clearing of mangroves for shrimp culture, with another 14% due to other forms of aquaculture (Valiela *et al.*, 2001). Some of the most rapid losses took place in the 1990s, and often these aquaculture development projects were supported by governments (Primavera & Esteban, 2008).

Other causes of mangrove loss include over-harvesting (*e.g.*, for wood chips), over-fishing, pollution, sedimentation, and alteration of water flow. Figure 3 shows an

Table 4 Change in mangrove area, by region 1980-2005 (FAO, 2007).

Region	Reduction (%)	Annual change (%)
East Asia	33.4	1.3
Pacific Islands	28.8	1.2
Southeast Asia	26.5	1.1
North and Central America	23.3	0.9
Middle East	17.0	0.7
West and Central Africa	16.0	0.6
South Asia	15.5	0.6
South America	11.0	0.4
East Africa	7.9	0.3
Australia and New Zealand	0.6	0.0
Average	18.0	0.7

Fig. 3 Destruction of mangroves (right) due to road construction.

example of a road constructed without culverts across tidal flats. Tidal flow was impeded, and this led to mass mortality and total destruction of mangroves due to desiccation and salinization.

4.3 Mangrove loss by region

The following is a summary of region-wide mangrove losses. Some issues may be country- specific and may not apply to other countries of the region.

In Eastern and Southern Africa, mangroves have suffered fewer losses than elsewhere, with only an eight percent decline between 1980 and 2005 (FAO, 2007). Even so, they are heavily used, and in countries such as Kenya and Madagascar, there is significant degradation, as trees are sparse and stunted due to over-exploitation. Some mangrove forests have been converted to rice fields, salt pans and shrimp ponds, but not to the extent as in Asia.

The Middle East has some of the most arid coastlines in the world. Although four species are recorded, only *Avicennia marina* is widespread, typically growing as a shrub in small stands. Goats and camels of the Bedouin nomads browse the mangroves, which are also harvested for timber and firewood. In recent years, mangroves have been destroyed due to coastal development.

In South Asia almost all mangroves have been impacted by humans, and large areas have been lost through over-exploitation or conversion to aquaculture and agriculture. Concern over the loss of mangroves has stimulated reforestation programs in Bangladesh, Pakistan and India.

In Southeast Asia, mangroves have long been a source of timber and fishery resources. While the Matang mangroves in Malaysia have been sustainably managed for timber for over 100 years and are known to be one of the best managed mangrove forests in the world, there are huge contrasts elsewhere in the region where mangrove degradation and loss have been rampant. Since the 1970s, shrimp aquaculture has intensively degraded vast areas of mangroves in Thailand, Vietnam, the Philippines and Java and Kalimantan of Indonesia.

In East Asia, mangroves occur along the coasts of southern China, Taiwan and the southern islands of Japan. With the exception of mangroves in Japan, which are well-protected, the mangroves of East Asia are among the most altered mangrove ecosystems in the world, due mainly to coastal development.

In Australia and New Zealand, mangrove deforestation has been minimal, with some local development for urban expansion and marina development. Overall, mangroves in Australasia are well-protected.

In the Pacific, mangroves are generally appreciated and recognized by the people for their value; however, significant mangrove loss has occurred in some countries due to urban and resort development for tourism.

In North and Central America, the causes of mangrove loss have been conversion for urban and tourism development, agriculture and aquaculture. However, the US, Mexico and Cuba are showing considerable interest in mangrove protection. Hurricanes are a major, highly destructive natural hazard, and impacted mangroves take years or decades to recover.

In South America, large areas of mangroves remain. There has been considerable loss, however, due to shrimp aquaculture, notably in Ecuador and northern Peru. In eastern Guyana, mangroves have been converted to agricultural land.

In West and Central Africa, widespread loss of mangroves is associated with conversion to urban and agricultural land and, in more arid areas, the creation of salt pans. In the Niger Delta, oil and gas extraction has caused pollution, damaged fish stocks and contributed to the degradation and loss of mangroves.

5. Management of Mangroves

There is increased recognition of the importance of mangroves worldwide and efforts have been made to manage these ecosystems sustainably for forestry and fishery use. Policies, legislation and management are largely developed at the national scale. Mangrove forests in some parts of the world have been managed for timber production. One well-known example is the mangroves (41,000 ha) in Matang, Malaysia, which have been managed successfully for more than 100 years (Azahar Muda, 2003). Such forests are managed on a sustained yield basis with well-established and productive *Rhizophora* plantations. Based on comprehensive ten-year management or working plans, thinning (15 and 20 years) is undertaken to produce an intermediate crop, followed by final felling at 30 years. Enrichment planting is routinely carried out. Successful management requires the commitment of national governments. There may be several ways to manage mangroves effectively. The way towards sustainable forestry practices requires a balance between utilization and conservation, augmented with protection and rehabilitation.

6. Conservation of Mangroves

In many countries, efforts have been made to conserve and rehabilitate mangroves. A good example of political change favoring mangrove conservation is Thailand, where there occurred a nearly 50% decline in mangroves from 1961 to 1996 due to aquaculture, agriculture, urbanization, and road, port and harbor construction (Charuppat & Charuppat, 1997). In 1998, the Thai cabinet revised its 1987 national policy and management practices for mangrove resources (Aksornkoae, 2004). All mangrove areas in Thailand are classified into two zones. In the conservation zone, any change or utilization of the mangrove forest is absolutely prohibited. In the development zone, government agencies are authorized to rehabilitate any degraded mangrove area, and utilization for fisheries, tin mining, cultivation and other activities must be strictly controlled in accordance with proven conservation techniques.

A major constraint in managing mangroves is the

complexity of mangrove distribution in the coastal zone. Various governmental agencies such as those of fisheries, forestry, coastal planning, agriculture and environment have jurisdiction over the coastal resources, and their policies are often in conflict. It is therefore important for relevant government agencies and stakeholders to work together to establish sound policies and legislation, and also protect not only the mangroves but also the adjacent ecosystems, such as sea grasses and coral reefs.

A number of countries, including Brazil, Mexico, Cambodia, El Salvador and Tanzania, have established legal frameworks for the protection of mangroves. Designation of protected areas is one way to protect mangrove forests. Among measures for international level protection are the World Heritage Convention, Ramsar Convention, and Biosphere Reserves of UNESCO-MAB. There are 1,200 protected areas worldwide that include mangroves, and they account for about 25% of total mangroves (Spalding *et al.*, 2010).

7. Restoration and Afforestation Efforts

In recent years, mangrove restoration efforts have been made in many countries. Among the most important lessons learned is that it is critical to involve local communities. They are often the main beneficiaries of mangrove ecosystems and they often suffer the most from the conversion of mangroves. In the Philippines, the success rate of reforestation projects has been highest in community-led projects (Primavera & Esteban, 2008).

A number of studies have been conducted on the role of mangroves in mitigating the impact of tsunami waves and in coastal protection. Some of them have shown that coastal areas behind mangroves suffered less damage after the 2004 Indian Ocean Tsunami (Dahdouh-Guebas *et al.*, 2005; Danielsen *et al.*, 2005; Kathiresan & Rajendran, 2005). On the other hand, there have been other researchers who have pointed out that elevation and distance from the shore are more important factors (Kerr *et al.*, 2006; Baird & Kerr, 2008). Another study found a significant role of mangroves in protecting villages and reducing death toll in Orissa, India, during the super-cyclone in 1999 (Das & Vincent, 2009).

Many countries have conducted mangrove rehabilitation projects to establish green-belts along their coastlines. UNEP (2007) reported that 27,500 ha had been planted with 30 million mangrove seedlings in Aceh, Indonesia, following the tsunami. Most of the planting, however, was unsuccessful due to poor species and site selections, insufficient preparation, inadequate guidance, and lack of tending (Chan & Baba, 2009). The emphasis was on the number of seedlings planted and not on percentage survival. A successful mangrove afforestation project has been implemented by ISME in the Republic of Kiribati since 2005 (Baba, 2011). Funded by Japan's Cosmo Oil Company, Ltd., the project involved the participation of local environmental youth groups and school children. A unique close group planting technique was applied where three propagules per group of *Rhizophora stylosa* were planted at a close spacing of 25 x 25 cm and 50 x 50 cm along the shoreline between the mean water level and the mean high water level (Fig. 4). Close group planting (with a preferred spacing of 50 x 50 cm) promotes faster seedling growth within and between groups through intra-specific competition. Within each group, at least one seedling will usually grow faster. The foliage of the established seedlings provides shade to the soil surface beneath. The shade ameliorates the surface soil temperature and reduces evaporation, leading to less salt accumulation on the soil surface (Baba, 2011). At the Ananau Causeway, survival was 90% after one year and over 50% after three years, with trees bearing flowers and fruits (Suzuki *et al.*, 2009). During a special visit in September 2011, Mr. Ban Ki-moon, the Secretary General of the UN, planted mangroves alongside Mr. Anote Tong, President of Kiribati, using this method.

Fig. 4 A unique close-group planting technique developed by ISME in Kiribati.

8. International Cooperation for Mangrove Ecosystems

There is an urgent need for conservation and sustainable management of existing mangrove ecosystems, and to rehabilitate degraded mangrove forests. As similar problems are observed in different countries worldwide, it is wise to share the lessons learnt through case studies of success and failure. In this context, international collaboration and cooperation are pertinent.

ISME is an international non-government and non-profit scientific organization with more than 20 years of experience in conservation, rehabilitation and sustainable management of mangrove ecosystems. Through international cooperation, the society collects, evaluates and disseminates information on mangrove ecosystems. As of December 2012, ISME's membership stood at over 1,100 individual members and 40 institutional members from 93 countries. The society has conducted projects and activities in Brazil, India, Indonesia, Kiribati, the Maldives, Malaysia, Pakistan, Samoa, Thailand, Tuvalu, UAE and Vietnam. The society has also undertaken research, conducted training courses and organized international conferences in support of sustainable management and rational use of mangrove ecosystems. A 2.5-month training course, *Conservation and Sustainable Management of Mangrove Ecosystems,* has been implemented by ISME since 1995. Funded by JICA, a total of 119 trainees from 39 countries have participated. ISME has also published a number of books. Recent publications include the *World Atlas of Mangroves* in English, French and Spanish (Spalding *et al.*, 2010), *Summary of World Atlas of Mangroves* (ITTO, 2012), and *Manual on Guidelines for Rehabilitation of Coastal Forests Damaged by Natural Hazards in the Asia-Pacific Region* (Chan & Baba, 2009). A policy brief, *Securing the Future of Mangroves*, was published with partners of the 2010 Atlas for decision-makers (Van Lavieren *et al.*, 2012).

ISME is publishing a trilogy as part of its *Mangrove Educational Book Series*. The three books (Baba *et al.*, 2013; Clough, 2013; Ong & Gong, 2013) provide comprehensive and updated accounts of mangroves – their distribution, structure, function, and environmental and socio-economic values.

As considerable knowledge on sustainable management and utilization of mangroves is available, there is an urgent need to provide financial and social incentives for its long-term implementation. We believe that one of the potential schemes which would provide necessary financing for mangrove restoration activities is the Clean Development Mechanism (CDM) under the UN Framework Convention on Climate Change (UNFCC) from the Kyoto Protocol. Another potential scheme is sustainable management and protection of mangroves under the support of Reduced Emission from Deforestation and Degradation (REDD+). Developing countries can apply for funds to reduce loss of forest coverage, restore areas and/or increase areas of new forest.

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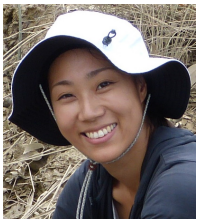

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